

We claim:

1           1.     An acoustic transducer comprising:  
2                 a substrate having a topside and a backside;  
3                 a microfabricated acoustic transducer formed on the topside of the substrate; and  
4                 a damping material disposed on the backside of the substrate, the damping  
5 material suppressing substrate acoustic modes.

1           2.     An apparatus according to claim 1 wherein the damping material has an acoustic  
2 impedance that is similar to the acoustic impedance of the substrate and is lossy.

1           3     An apparatus according to claim 1 further including electronic circuits formed in  
2 the substrate.

1           4.     An apparatus according to claim 3 wherein the electronics circuits are in between  
2 the sensor and the damping material.

1           5.     An apparatus according to claim 1 wherein the substrate is a wafer.

1           6.     An apparatus according to claim 1 wherein the damping material suppresses a  
2 longitudinal ringing mode.

1           7.     An apparatus according to claim 1 wherein the damping material suppresses a  
2 lamb wave ringing mode.

1           8.     An apparatus according to claim 1 wherein the microfabricated acoustic  
2 transducer operates at frequencies above 20 kHz.

1           9.     An acoustic transducer comprising:  
2                 a substrate having a topside and a backside, the substrate having a thickness such  
3 that resonant modes of the substrate are outside a frequency band of interest; and  
4                 a microfabricated acoustic transducer formed on the topside of the substrate.

- 1           10.    An apparatus according to claim 9 further including:  
2                a damping material disposed on the backside of the substrate, the damping  
3 material suppressing substrate acoustic modes.
- 1           11.    An apparatus according to claim 10 wherein the damping material suppresses  
2 lamb wave modes.
- 1           12.    An apparatus according to claim 10 wherein the damping material has an acoustic  
2 impedance that is similar to the acoustic impedance of the substrate and is lossy.
- 1           13.    An apparatus according to claim 12 further including electronic circuits formed in  
2 the substrate.
- 1           14.    An apparatus according to claim 13 wherein the electronics circuits are in  
2 between the sensor and the damping material.
- 1           15.    An apparatus according to claim 9 further including electronic circuits formed in  
2 the substrate.
- 1           16.    An apparatus according to claim 9 wherein the substrate is a wafer.
- 1           17.    An apparatus according to claim 9 wherein the microfabricated acoustic  
2 transducer operates at frequencies above 20 kHz.
- 1           18.    An apparatus according to claim 9 wherein the damping material suppresses  
2 stonely wave modes.
- 1           19.    A method for suppressing acoustic modes, the method comprising:  
2                providing a substrate having a topside and a backside;  
3                forming a microfabricated acoustic transducer on the topside of the substrate; and  
4                placing a damping material on the backside of the substrate, the damping material  
5 suppressing substrate acoustic modes.

1           20.    The method of claim 19 wherein the damping material has an acoustic impedance  
2   that is similar to the acoustic impedance of the substrate and is lossy.

1           21.    The method of claim 20 further comprising forming electronic circuits in the  
2   substrate.

1           22.    The method of claim 21 wherein the electronics circuits are in between the sensor  
2   and the damping material.

1           23.    The method of claim 19 wherein the substrate is a wafer.

1           24.    The method of claim 19 wherein the damping material suppresses a longitudinal  
2   ringing mode.

1           25.    The method of claim 19 wherein the damping material suppresses a lamb wave  
2   ringing mode.

1           26.    The method of claim 19 further comprising operating the microfabricated acoustic  
2   transducer at frequencies above 20 kHz.

1           27.    A method for suppressing acoustic modes, the method comprising:  
2                    providing a substrate having a topside and a backside, the substrate having a  
3   thickness such that resonant modes of the substrate are outside a frequency band of interest; and  
4                    forming a microfabricated acoustic transducer on the topside of the substrate.

1           28.    An apparatus according to claim 27 further including:  
2                    a damping material disposed on the backside of the substrate, the damping  
3   material suppressing substrate acoustic modes.

1           29.    The method of claim 28 wherein the damping material suppresses lamb wave  
2   modes.

1 30. The method of claim 28 wherein the damping material has an acoustic impedance  
2 that is similar to the acoustic impedance of the substrate and is lossy.

1 31. The method of claim 30 further comprising forming electronic circuits in the  
2 substrate.

1 32. The method of claim 31 wherein the electronics circuits are in between the sensor  
2 and the damping material.

1 33. The method of claim 27 further comprising forming electronic circuits in the  
2 substrate.

1 34. The method of claim 27 wherein the substrate is a wafer.

1 35. The method of claim 27 further comprising operating the microfabricated acoustic  
2 transducer at frequencies above 20 kHz.

1 36. The method of claim 27 wherein the damping material suppresses stonely wave  
2 modes.